R E P O R T R E S U M E S

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THE EFFECT OF HEADSTART ON DEVELOPMENTAL PROCESSES.

BY- EISENBERG, LEON CONNERS, C. KEITH
JOHNS HOPKINS UNIV., BALTIMORE, MD.

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AS PART OF AN EFFORT TO ASSESS THE EFFECT OF THE BALTIMORE HEAD START PROGRAM ON COGNITIVE DEVELOPMENT, CHILDREN ENROLLED IN THIS PROGRAM WERE GIVEN THE PEABODY PICTURE VOCABULARY TEST (PPVT) AND THE DRAW-A-PERSON (DAP) TEST AT THE START OF THE PROGRAM, AT ITS TERMINATION, AND WHEN THEY ENROLLED IN KINDERGARTEN. A CONTROL GROUP, DRAWN FROM THE SAME NEIGHBORHOODS, WAS TESTED AT KINDERGARTEN ENROLLMENT. THE NUMBER OF CHILDREN TESTED IN EACH GROUP WAS SLIGHTLY OVER 400. DATA ON THE FAMILIES OF THE HEAD START CHILDREN INDICATED THAT THEY WERE SEVERELY DISADVANTAGED. RESULTS OF THE PPVT SHOWED SIGNIFICANT GAINS DURING THE PROGRAM AND BETWEEN THE END OF THE PROGRAM AND KINDERGARTEN ENROLLMENT. THE CONTROL GROUP SCORED AT THE SAME LEVEL THAT THE HEAD START CHILDREN HAD SCORED AT THE BEGINNING OF THE PROGRAM. RESULTS OF THE DAP TEST SHOWED A SIMILAR PATTERN OF GAINS, BUT WITH THE CONTROL GROUP SCORING AT THE SAME LEVEL THAT THE HEAD START CHILDREN HAD SCORED AT THE END OF THE PROGRAM. CLASSROOM EVALUATIONS OF TEACHER BEHAVIOR WERE MADE, AND PRELIMINARY ANALYSES INDICATE THAT TEACHERS WHO WERE RATED AS WARM, VARIED, AND FLEXIBLE AND WHO SPENT A RELATIVELY HIGH PROPORTION OF TIME TEACHING PRODUCED THE HIGHEST GAINS. (DR)

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The Effect of Headstart

on Developmental Processes*

by

Leon Eisenberg, M.D. and C. Keith Conners, Ph.D.
Johns Hopkins University School of Medicine

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Reports by now numbering in the thousands have made abundantly clear a substantial association between social class and intelligence test scores, between social class and academic achievement, between social class and ultimate occupational status. What has long been a matter of dispute is the source of these associations. Some argue that those of lower intellectual endowment sink into the lower social classes and there produce children like themselves via assortative mating. Others maintain with equal fervor that the educational and domestic conditions of lower class life act upon a normally distributed initial genetic potential to depress performance via biological, motivational and cognitional mechanisms (1).

The usual methods for assessing the contribution of genetic factors, in particular selective breeding, are impossible in man. Purely observational studies suffer from the inherent limitation that the variables are confounded; the parents that give birth to the child are the parents who rear him in the very environment alleged to have a decisive impact. One way out of the dilemma lies in an experimental approach through the careful assessment of the effect of special environmental enrichment which, although never optimal because of practical considerations, should diminish the customary performance deficits to the extent that these deficits result from environmental factors.

Thus, Project Headstart, a national effort at educational intervention in the pre-school life of some 560,000 American children in the summer of 1965, afforded an unparalleled opportunity for field studies of an intellectual "polio vaccine." Despite our realization of the constraints on method and design that would be imposed by considerations of time, space, and staff, the members of our division of child psychiatry

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agreed upon a self-imposed mobilization of effort to assess the effect of Baltimore's Headstart program on selected aspects of cognitional development in the children it enrolled. Some of our findings will be reported here; others will be described in subsequent papers.

METHODS

The Baltimore program enrolled some 480 children in public school classes and an additional 65 in a church nursery program. Each mother applying to the public schools was required to complete a brief form on which demographic data were recorded. Contrary to the demands of our original design, there were too few children in excess of available space to constitute an initial control group. We were therefore limited to a control selected from the same classes (and therefore the same neighborhoods) attended by our Headstart graduates when they were enrolled in public school in September. Our revised plan, then, included test measurements on Headstart children in June in the first week of the program (H-1), in August at its termination (H-2), and in September upon enrollment in kindergarten (H-3) and measurements on the controls only in kindergarten in September (C). Classes were limited in size to 15 children. Daily attendance in Baltimore exceeded 90%.

The necessity to examine large numbers of children within several days at each test interval limited us to measures that were brief and could be administered by rapidly trained non-professional volunteers, for whose recruitment we are indebted to the Red Cross. The tests employed were the Peabody Picture Vocabulary Test (PPVT) and the Draw-A-Person (DAP), both of which have been shown to correlate respectably with standard intelligence tests in middle-class populations (2,3). Moreover, satisfactory test retest reliability has been demonstrated for the PPVT in a comparison of non-professional and professional examiners 4).

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As a second aspect of our general study, eight observers were trained individually to record ongoing teacher behavior in classrooms and to score this behavior for a number of variables. Each teacher was seen on four different occasions by four of the eight observers.

POPULATION CHARACTERISTICS

Fifty-one percent of the Headstart children came from families with total annual incomes of less than $3000 (30% were on welfare); forty percent were in the $3000 to $5000 range (Table I). Sixty-two percent of the fathers and 57% of the mothers had no more than a tenth grade education and only 3% had more than 12 grades (Table II). Sixty-four percent of the fathers were unskilled workers; 38% of the mothers were single, widowed, divorced or separated. Only 7% of the children had had previous experience of day care. Clearly then we were dealing with a severely disadvantaged population.

TEST RESULTS

Figure 1 indicates the distribution of PPVT raw scores for the Headstart population in June before training and for the control population in September without training. The two curves are almost identical despite an age advantage of 10 weeks for the controls. However, inspection of the mean raw scores by month of age for the 712 children in both Headstart and control groups before training reveals a monthly rate of change so irregular and so small as to lead to no expectation of significant difference over this small time interval. Thus, these data permit the conclusion that the Headstart and control populations did not differ in vocabulary before the summer experience.

Figure 2, however, demonstrates progressive and substantial gains at each successive testing for the Headstart group.

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Figure 3, combining the main findings of Figures 1 and 2, contrasts the distributions of PPVT performance of Headstart and control groups when both were tested in kindergarten in September. The differences are striking.

Table III summarizes our PPVT findings in the form of mean and standard deviation raw scores for Headstart at each testing, for control, and for the standardization sample in the Peabody manual (2). The differences between the second and third Headstart means and the initial Headstart and control means are significant at well beyond the 0.0001 level. However, the Headstart group after the 6-week program is still inferior to the "normative" sample.

When the initial Headstart population was divided into quartiles and the mean change for each quartile computed, all four quartiles showed net gains, but progressively smaller in amount, varying from 13.55 to 10.05 to 5.16 to 0.85, respectively. Since children were lost to the sample, both by dropout (41) or by absence on the day of testing (46), each lost group was compared with a matched sample to make certain that selective loss did not account for the apparent gains; the lost groups did not differ from their matched controls on initial testing.

The results from the DAP are displayed in Table IV. Once again the difference between Headstart and control is highly significant in favor of Headstart by September ($p < 0.01$) However, in this instance, the controls are at the same level as Headstart in August (H-2). Inspection of the raw scores by month of age for the PPVT and the DAP for all untrained subjects (Headstart pre-test plus controls) demonstrates that there is a more regular and a larger change with age for the DAP than the PPVT. Apparently, the slum environment provides stimulus conditions more adequate

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for the maturation of figure drawing than of hearing vocabulary. This is further evidenced by the fact that the degree of deficit registered in our slum population in comparison to standardization samples is greater for the PPVT than for the DAP. The two tests (initial values) correlated in our population at a significant but low value (0.39), but it should be noted that the limited range of ages and scores would necessarily attenuate any true correlation. At the least, the DAP findings further served to indicate that the control population was not initially inferior to the experimental one.

The importance of the specific environment on intellectual growth is further demonstrated by differences in IQ gain attributable to different patterns of teacher behavior. Preliminary analyses of teacher behavior patterns, for example, show that teachers rated as warm, varied in their activity, and flexible produced significantly greater average change in IQ than their opposites ($p < 0.05$ by analysis of variance). Moreover, there is a highly significant difference in amount of IQ gain between those classrooms in which teachers spend a high proportion of their time teaching as opposed to merely playing or enforcing obedience ($p < 0.001$ by analysis of variance). These results suggest not only that pre-school experience in general but a special form of competent pre-school teaching can lead to highly significant gains in deprived children.

Thus, we have demonstrated significant gains attributable to the Headstart experience by both the PPVT and the DAP. Differences of this magnitude cannot be explained away by test repetition (4,5) or, as we have shown, by initial asymmetry in comparison groups. Our findings are in accord with those reported by others (6,7) who have evaluated children enrolled in more extensive pre-school programs. They are affirmed by

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simultaneous studies on sub-samples of Headstart and control populations by our colleagues Dr. Washington, Dr. Kofsky, and Dr. Rosenberg who found, by Binet, Columbia Mental Maturity Scale, and special perceptual tests, significant advantages in favor of Headstart.

What must be considered remarkable is that these gains were obtained by a six-week program conducted by elementary school teachers without extensive training and experience with pre-schoolers. How much more might we not anticipate from year long thoroughly planned and pedagogically more sophisticated programs of pre-school enrichment!

We are, however, far from convinced that these gains will endure, given the over-crowding, educational impoverishment, and generally negative attitudes toward the poor that characterize inner-city elementary schools. We would not, after all, anticipate that a good diet at age 5 would protect a child against malnutrition at age 6. The mind, like the brain, requires alimentation, biochemical, physiological, and cognitive, at every stage of its development. The durable gains from Headstart will be measured less by our test findings, however significant, than by the demonstration that a national effort could be mounted, by the experience offered teachers in working with classes of 15 instead of 40, by the firsthand knowledge gained by volunteers, many of whom for the first time confronted the ugly face of poverty.

What has been shown by Headstart was known to Binet (8) whose test has been used with such little appreciation of what he wrote in 1909, "...some recent philosophers appear to have given their consent to the deplorable verdict that the intelligence of the individual is a fixed quantity...we must protest and act against this brutal pessimism ...a child's mind is like a field for which an expert farmer has advised

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a change in the method of cultivation, with the result that in place of desert land, we now have a harvest. It is in this particular sense, the one which is significant, that we say that the intelligence of children may be increased. One increases that which constitutes the intelligence of the school child; namely, the capacity to learn, to improve with instruction..."

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TABLE I

Years of Schooling

Grades	Fathers No.	Fathers %	Mothers No.	Mothers %
6 or less	39	13	23	7
7 - 10	143	49	173	50
11 - 12	98	35	145	41
13 +	10	3	9	2
Subtotal	290	100	350	100
Unknown	71	20	11	3
Grand Total	361		361	

TABLE II

Yearly Income

	Number	Percent of Total	Percent of Answered
Under $3000	160	44%	50%
$3000 - $5000	129	36%	41%
Over $5000	29	8%	9%
No Answer	43	12%	
Total	361	100%	

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TABLE III

PPVT Raw Scores

	Control	Headstart			Stand. Sample
		H_1	H_2	H_3	
Mean	33.65	32.63	36.83	39.74	50.22
S.D.	11.70	12.33	10.82	11.34	8.17
(N)	(402)	(424)	(413)	(402)	(133)

TABLE IV

DAP Raw Scores

	Control	Headstart			Stand. Sample
		H_1	H_2	H_3	
Mean	8.91	7.71	9.10	9.75	15.2
S.D.	4.98	4.79	4.20	4.41	5.01
(N)	(420)	(500)	(476)	(435)	(300)

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Fig. 1

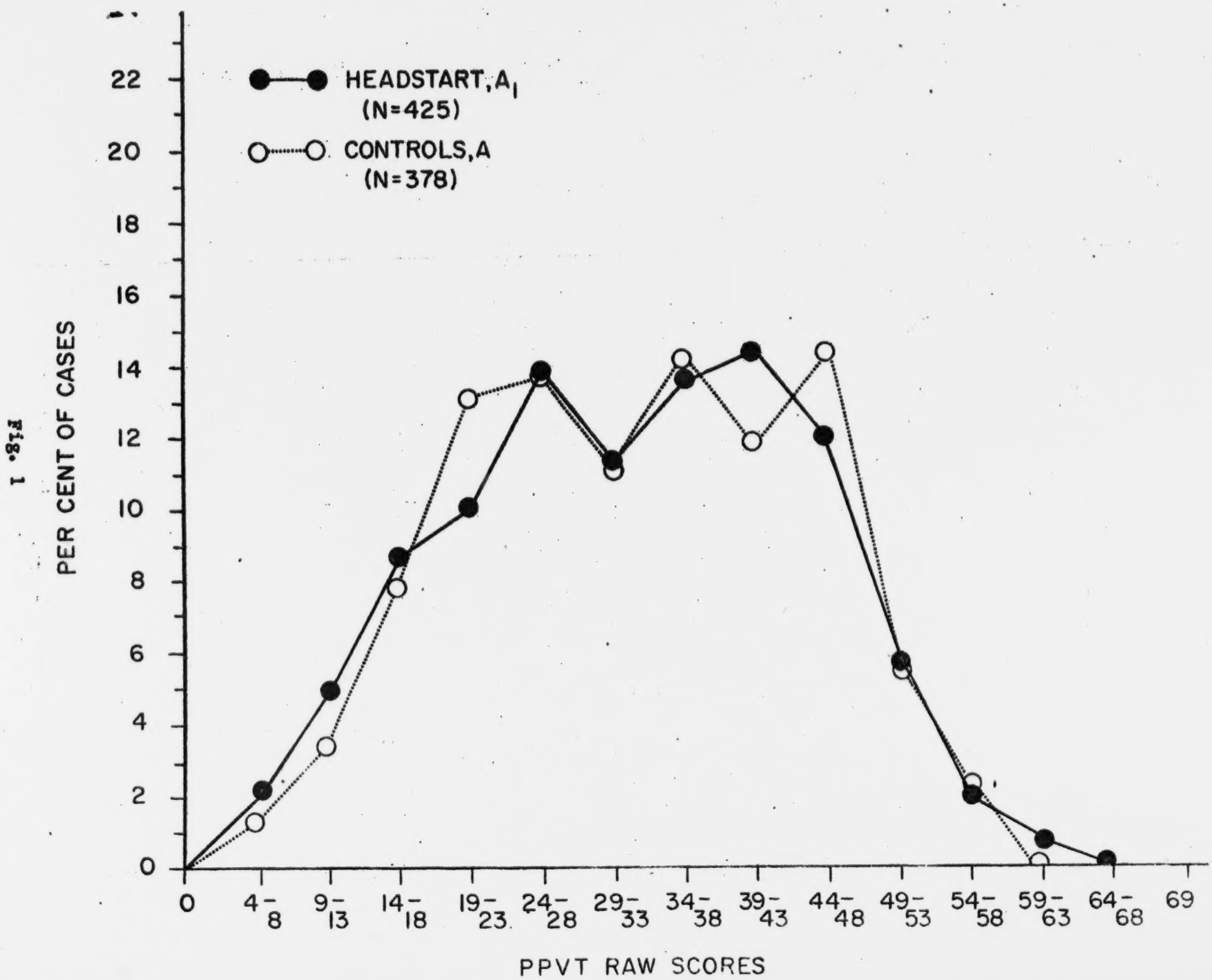
HEADSTART, A1
(N=425)
CONTROLS, A
(N=378)
PER CENT OF CASES
0
2
4
6
8
10
12
14
16
18
20
22
0
4–8
9–13
14–18
19–23
24–28
29–33
34–38
39–43
44–48
49–53
54–58
59–63
64–68
69
PPVT RAW SCORES

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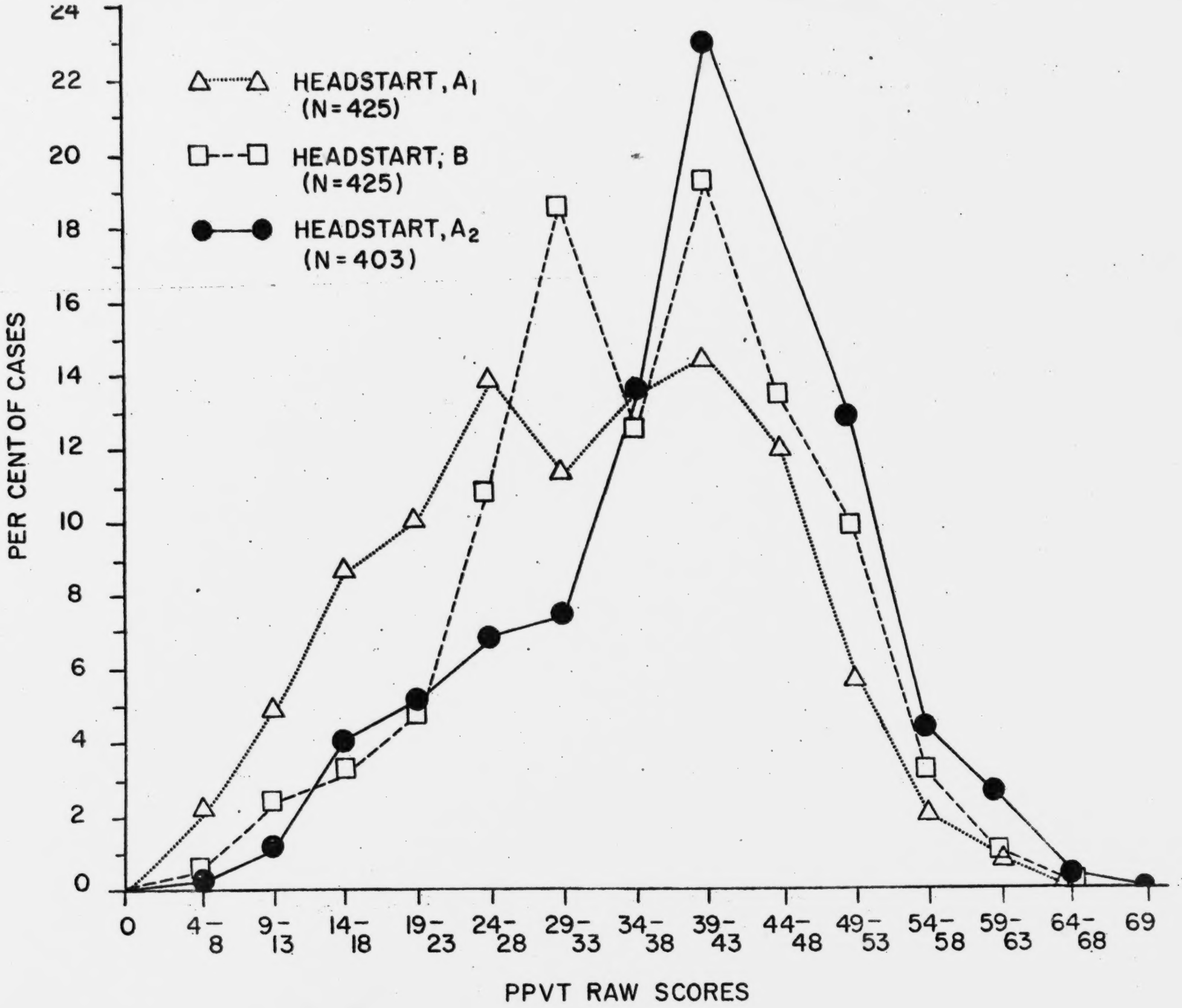
FIG. 2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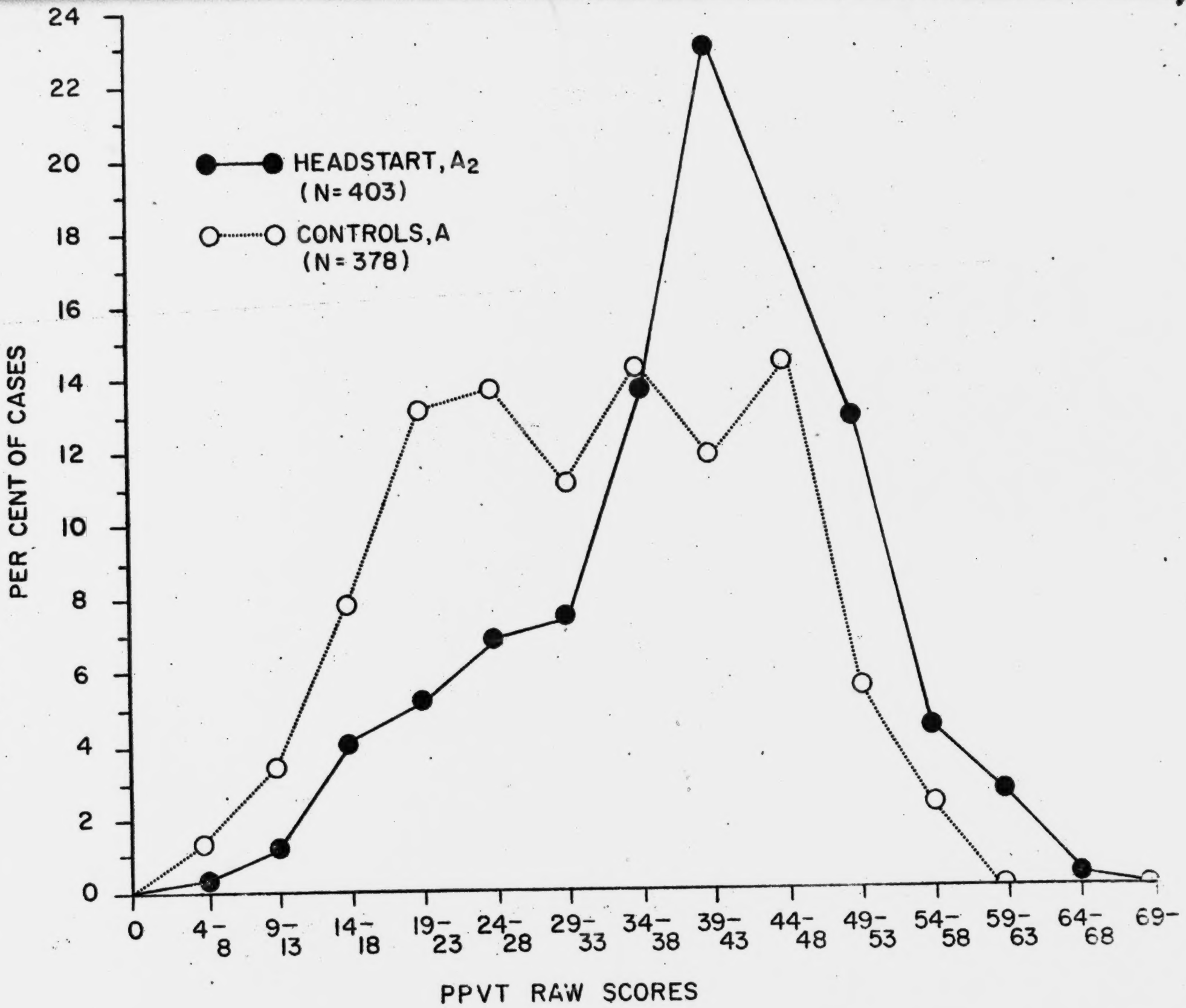
HEADSTART; B (N=425)
HEADSTART, A2 (N=403)
PER CENT OF CASES
0
2
4
6
8
10
12
14
16
18
20
22
24
0
4–8
9–13
14–18
19–23
24–28
29–33
34–38
39–43
44–48
49–53
54–58
59–63
64–68
69
PPVT RAW SCORES

FIG. 3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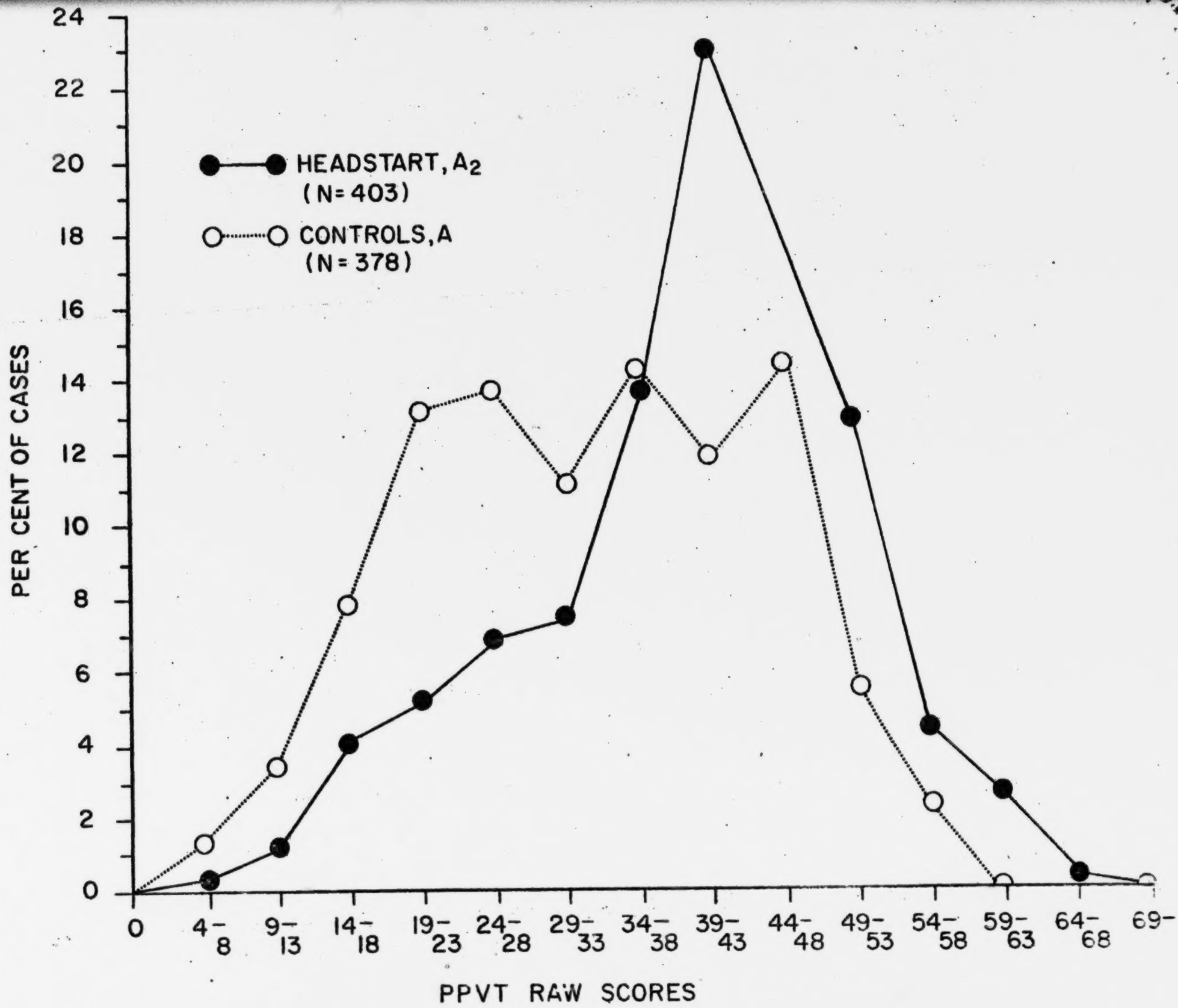
(N=403)
CONTROLS, A
(N=378)
PER CENT OF CASES
0
2
4
6
8
10
12
14
16
18
20
22
24
0
4–8
9–13
14–18
19–23
24–28
29–33
34–38
39–43
44–48
49–53
54–58
59–63
64–68
69–
PPVT RAW SCORES

FIG. 3


HEADSTART, A2
(N=403)
CONTROLS, A
(N=378)
PER CENT OF CASES
24
22
20
18
16
14
12
10
8
6
4
2
0
0
4–8
9–13
14–18
19–23
24–28
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34–38
39–43
44–48
49–53
54–58
59–63
64–68
69–
PPVT RAW SCORES